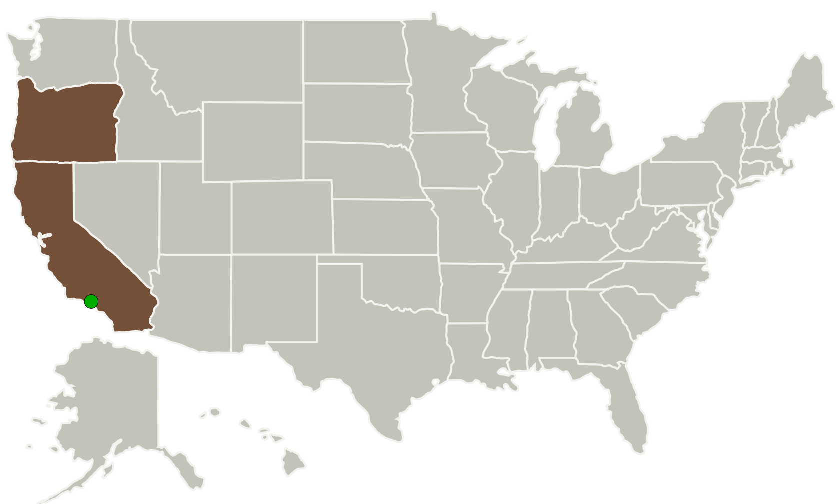
Robust, Low SWAP Planetary Entry, Descent and Landing System, Phase I

Completed Technology Project (2016 - 2016)

Project Introduction

A spacecraft's guidance, navigation, and control system needs 3D imagery of proximity objects or surfaces in the targeted space segment. Ideally, this data is obtained using sensors with low size, weight, and power (SWAP). The spatial- and depth-resolution capabilities that can be achieved using laser detection and ranging (LADAR) sensors in a small-sized detector without requiring large processing resources make LADAR a suitable choice for hazard detection, absolute-state estimation, landing/sampling site selection, and/or body-shape characterization. To address this opportunity, hardened silicon (Si) Geiger-mode (Gm) LADAR focal plane arrays (FPAs) will be developed. In Phase I, spot-scan, line-scan, area-scan, and 2D-flash LADAR formats will be considered. They will specifically take into account platform SWAP, calibration, deep-space environmental conditions, rigors of landing on planetary bodies both with and without atmospheres, and planetary protection requirements. With a radiometric budget, end-to-end physics-based system models combined with Monte Carlo detector models and numeric receiver circuit simulations will be performed to provide accurate range and range-precision predictions. Candidate silicon single-photon avalanche photodiode (SPAD) detectors and readout integrated circuits (ROICs)integrating time-of-flight (TOF), time-to-digital converters (TDC), time-to-amplitude converters (TAC), and active quenching circuits (AQDs)will be demonstrated in a benchtop LADAR testbed.

Primary U.S. Work Locations and Key Partners



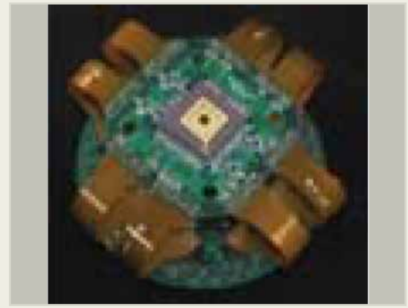


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Table of Contents

Organizations Performing Work	Role	Type	Location
Voxtel, Inc.	Lead Organization	Industry	Beaverton, Oregon
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Oregon

Project Transitions

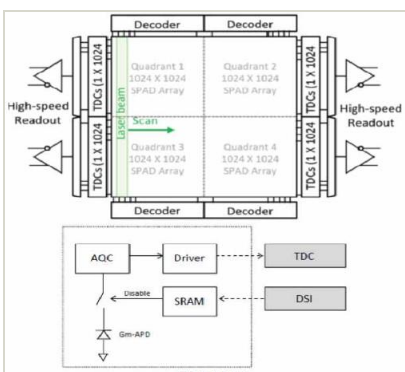
June 2016: Project Start

December 2016: Closed out

Closeout Documentation:
- Final Summary Chart*(https://techport.nasa.gov/file/139623)*

Images

Briefing Chart Image
Robust, Low SWAP Planetary Entry, Descent and Landing System, Phase I
(https://techport.nasa.gov/image/135472)



Final Summary Chart Image
Robust, Low SWAP Planetary Entry, Descent and Landing System, Phase I Project Image
(https://techport.nasa.gov/image/136953)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Voxtel, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

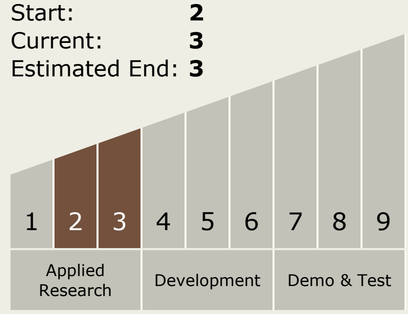
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
George Williams

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
  └ TX09.3 Landing
    └ TX09.3.1 Touchdown Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System